



#### ABSTRACT

About 340,000 acres of land in the Florida Everglades, Louisiana river parishes, and Puerto Rico are well suited for rice production. If the areas were fully developed, approximately 200,000 acres could produce a crop annually, with 30,000 to 40,000 acres in Puerto Rico producing two crops. The acreage most likely to be developed would depend on farm prices. It ranges between 90,000 and 160,000 acres, with crops of 5 to 9 million hundredweight of rice. The impact of this production on supplies of and prices received for U.S. rice would be comparatively minor.

Key words: Rice, Rice yields, Rice markets, Production costs, Price effects, Caribbean markets, Florida Everglades, Louisiana river parishes, Puerto Rico.

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## SUMMARY

About 340,000 acres of land in the Florida Everglades, the Louisiana river parishes, and Puerto Rico are well suited for rice production. If the areas were fully developed, approximately 200,000 acres could produce a crop annually, with 30,000 to 40,000 acres in Puerto Rico producing two crops.

If markets hold reasonably strong, with farm prices ranging from \$9.50 to \$10 per hundredweight (cwt), about 160,000 acres would likely be developed for rice production with a crop of about 9 million cwt. Sixty percent or more of this production would come from the Everglades, and 25 percent from Puerto Rico.

However, should farm prices range only from \$7 to \$7.25 per cwt and current price support and supply management programs be maintained, these areas would be expected to develop at only a modest rate. In 4 to 6 years, about 90,000 acres producing nearly 5 million cwt of rice would be developed.

Rice is traditionally grown in the Grand Prairie and northeast Arkansas, the Mississippi River Delta, southwest Louisiana, the Coast Prairie of Texas, and in Sacramento Valley, Calif. These areas produced 137.8 million cwt of rice from over 2 million harvested acres in 1978.

The impact of additional production on supplies of and prices received for U.S. rice would be comparatively minor. Other, largely unpredictable conditions, such as world production, would have a greater influence on markets for U.S. rice.

# Rice Production in Nontraditional Areas

Troy Mullins\*

## INTRODUCTION

Removal of controls on plantings, favorable prices, and the adaptability of the rice plant to a wide range of soils and climates has created interest in growing rice in several nontraditional areas. The present uncertainty for the sugar industry in the Florida Everglades, the Mississippi River parishes of southeast Louisiana, and Puerto Rico is prompting interest in the economic feasibility of establishing commercial rice enterprises in these areas.

This study provides background on these three nontraditional rice-growing areas; estimates suitable land available for growing rice, potential production, and possible markets; compares the cost of growing rice in these areas with that applicable to traditional areas; indicates the approximate change in total U.S. production if viable rice industries were established; and comments on foreseeable problems. Such information would be useful to all rice growers, those interested in establishing rice production in these areas, and rice drying, milling, and marketing managers and investors.

## BACKGROUND ON STUDY AREAS

Rice is traditionally grown in the Grand Prairie and northeast Arkansas, the Mississippi River Delta, southwest Louisiana, the Coast Prairie of Texas, and in Sacramento Valley, Calif. These areas produced 137.8 million hundredweight (cwt) of rice from over 2 million harvested acres in 1978.

About 340,000 acres of land in the Florida Everglades, the Louisiana river parishes, and Puerto Rico have adequate water supplies and are well suited for rice production (fig. 1). If the areas were fully developed, approximately 200,000 acres could produce a crop annually, with 30,000 to 40,000 acres in Puerto Rico producing two crops.

### Florida Everglades

The history of rice production in the Florida Everglades is well documented (1, 6). 1/ Commercial production is reported to have reached 2,000 acres in the

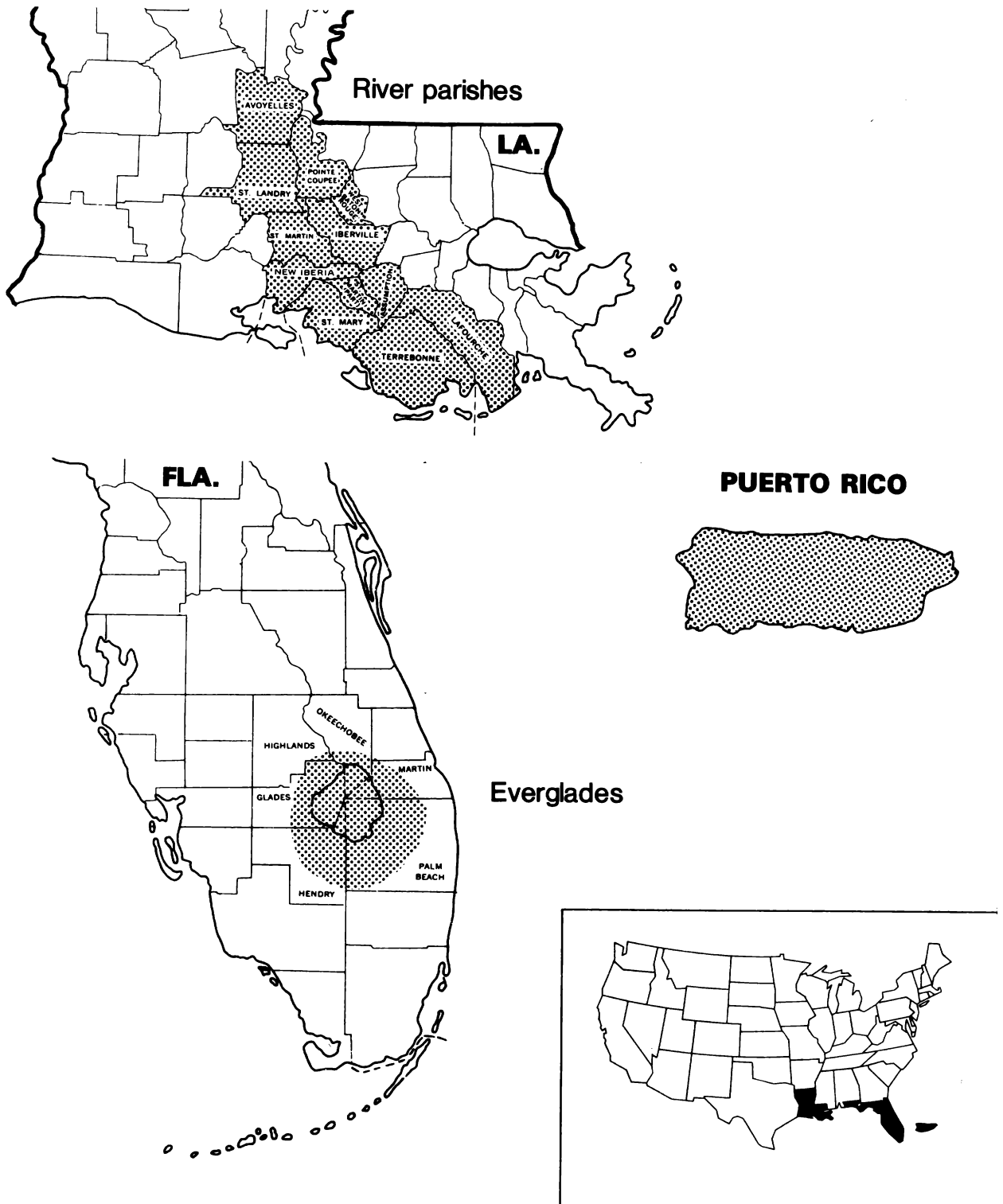
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1/ Underscored numbers in parentheses refer to references listed at the end of this report.

Figure 1.

# Nontraditional Rice Areas



fifties. However, records of the then Statistical Reporting Service indicate that the acres harvested never exceeded 700. 2/ Nevertheless, rice production was a viable industry supported by a farmers' cooperative which built and operated storage and milling facilities. With the discovery of hoja blanca (white leaf) in 1957, the area was quarantined and production for harvest abandoned (5, 8). 3/

The soils of the Everglades are organic muck soils which, if left in a dry tilled condition, deteriorate rapidly due to microbial oxidation and resulting subsidence. If unchecked, the fertility is soon depleted and profitable yields of cultivated crops are not possible. Sugarcane growers commonly flood their land during the idle season in preparation for replanting. Rice is commonly seeded in the flooded fields in the summer months when winter vegetable land is idle and later plowed under to add organic matter to the soil.

This practice aids in the control of nematodes (roundworms), insects, and non-aquatic weeds. The cover crop practice can be shifted to a crop for harvest simply by seeding an early maturing variety and allowing 2 to 3 additional weeks for maturity. The additional costs for improved seed, chemicals, aerial applications, pumping, and harvesting operations are about \$200 per acre. However, if the crop were marketed at \$8.50 per cwt, the returns above specified costs would be approximately \$120 per acre.

The rapid growth of urban centers, coupled with the influx of Cuban refugees, has resulted in a favorable market for rice within Florida. The long-term demand for rice in the Caribbean area also is regarded as favorable. Favorable conditions for commercial rice production in the Everglades are related to the following.

- (1) Following vegetables or sugarcane, only modest applications of fertilizer are required to produce yields comparable to the yield in traditional rice areas where higher fertilizer applications are required.
- (2) The well-developed canal and dike systems already established leave only the installation of gates, field levees, and pumps for removing water at harvest time as added capital requirements for irrigation facilities.
- (3) Proximity to markets could give local mills an advantage in transportation and related marketing activities.

#### 1977 and 1978 Field Trials

In 1977, a sugar company located in Palm Beach County financed the production and harvesting of 280 acres of rice in the organic soils typical of the Everglades area (1, 11). Varieties grown included labelle, lebonnet, starbonnet, and bonnet 73. About 10 percent of the acres planted were not harvested due to loss of stand in areas near levees soon after emergence and to application of water with excessive salt content to a small acreage during the growing season. No major problems with diseases were encountered. Yields of 37, 41, 44, and 44 cwt per acre were obtained for the first harvest in four separate fields. Yields from the second or ratoon crop harvested in three fields were 20, 22, and 24 cwt per acre.

A small-capacity batch dryer was constructed, but was not completed in time for use with the first harvest. The alternative procedure of spreading the green rice on a concrete floor and stirring at intervals proved ineffective in preventing spoilage.

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2/ The Statistical Reporting Service is now a part of the Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture.

3/ Hoja blanca is a virus disease known to occur only in the Western Hemisphere. It is most prevalent in such Latin American countries as Colombia, Cuba, and Venezuela.

Final disposition was by processing the green rice into feed for cattle. However, the dryer was available to dry the ratoon crop harvest and was effective in lowering the moisture to desired levels.

Several farmers in the area initiated trials during the 1978 season. A second sugar company planted about 40 acres, which included three common rice varieties grown in Florida (labelle, lebonnet, and brazos) and five varieties from Nicaragua. A vegetable grower employed an experienced rice farmer to supervise production on about 260 acres. As of September 1, 1978, the staff at the Everglades Experiment Station had determined that approximately 800 acres were harvested among seven growers, with yields generally in the 45-cwt range. Most of the rice was dried at the one dryer in the area, with some harvested at about 17 percent moisture hauled to mills in eastern Arkansas before drying. With expanding acreages in the Everglades, additional drying facilities will be required for the 1979 crop.

### Land Suitable for Rice

The land area characterized by organic soils is reported to be approximately 500,000 acres. The largest area developed for sugarcane and winter vegetable crops is in Palm Beach County where the organic soils are concentrated. Sugarcane is grown on approximately 300,000 acres of these soils, and winter vegetables on 50,000 acres. About 75,000 acres of sugarcane land lie fallow each year and could be seeded to rice. Through use of rice varieties with growing periods from late March to August, about 50 percent of the vegetable acreage could be used for rice production.

Water for irrigation is available from public and private canals which, in most instances, are at sufficient elevation to permit flooding by gravity flow. Cost of pumping generally is associated with draining the fields for harvest. Between June 1 and late August, rainfall usually exceeds the surface evaporation rate, which also aids in maintaining an adequate flood during the last half of the growing season.

### Major Problems

Several problems would have to be dealt with before rice production could become a commercial enterprise in the Everglades. (Since current rice varieties have high resistance to hoja blanca, this once important disease is no longer a problem.) Adequate experience of farmworkers in carrying out field practices at planting through harvesting and drying is a most important requirement. A large share of the farmworkers in the area are Cuban refugees with previous experience in growing rice. Their adjustment to the muck soils and other factors peculiar to the area probably could be accomplished within one or two seasons. Wage agreements that compensate workers for above average care of the crop could bring about noticeable increases in yields. Wage payments based on a share of production or a bonus for production above a specified yield per acre have been used successfully in other areas. With such arrangements and advice and assistance from research and extension personnel in applying known production technology, rice probably could be grown with success.

Beyond this, adequate drying and storage facilities are of first importance. Since the area is relatively small and production is dominated by large-scale corporate units, one or two commercial dryers at strategic locations could serve the total area. Unless fuel supplies (natural gas) become unusually limited in that area, drying costs should be approximately comparable to those in southwest Louisiana. Total storage capacity approximately equal to one season's production (45 cwt) per acre for first harvest and 15 cwt per acre of ratoon crop would be required near the dryers. Some storage facilities converted from other uses are available and may be sufficient to preserve the 1978 crop until it can be moved.



Several plans for disposing of the 1978 crop are being considered. One plan is to store the crop until a mill is constructed that is adequate to simply hull the rice. The rice can then be sold as brown rice. In this case, the market outlets would be limited. However, if financing for a mill were ensured in the fourth quarter of 1978, construction could be completed in 12 to 15 months and milling for disposition to local markets could be initiated. A second alternative is to sell rough rice to foreign countries that have milling facilities available; limited quantities from the southern areas have been marketed in the rough form. Finally, transporting the 1978 production to mills in southwest Louisiana or Greenville, Miss., is a possibility. Obviously, transportation costs would be high compared to such costs in traditional areas. Moving rice about 1,000 miles by truck (25-ton loads) is estimated to cost \$2.20 per cwt. However, an opportunity to ship by back-haul arrangement likely could be developed at a cost of about \$1.30 per cwt. Moving by barge from Tampa on the State's west coast to the Mississippi and north to Greenville as a back-haul operation would cost \$12 per ton, or 60 cents per cwt.

Participants in the Everglades rice project also are giving attention to building a rice mill to serve the area. One miller is currently investigating the situation, and if a substantial share of the capital requirements can be generated locally, the project could be initiated early in 1979. If projected harvesting of 50,000 to 60,000 acres annually is a reasonable long-term target, a mill capable of processing 300-plus barrels of rough rice per hour could be justified.

#### Louisiana River Parishes

The sugarcane industry in south central Louisiana is in a depressed situation at both the grower and processor levels. Cane yields in Louisiana have averaged only about 70 percent or less of the yields in the Florida Everglades. In the past several years, a number of sugar mills have been abandoned. At a time when prices received are only marginally above the cost of production, growers are faced with the added cost of hauling to more distant mills. As a result, many farmers are searching for a more profitable use for their land.

Extension personnel and others indicate that soybeans and corn are receiving the most attention as alternative crops, since present equipment on farms and harvesting equipment available by custom hire will minimize the capital outlay necessary to make the transition. Soybean plantings increased in several of the sugarcane-growing parishes in 1978. However, the less permeable soils normally used for sugarcane are well suited for rice production.

In 1956, farmers in eight parishes situated to the south of the Mississippi River between Baton Rouge and New Orleans grew rice on 9,625 acres. <sup>4/</sup> In this area, allotments were assigned to producers rather than to the land. During the sixties, practically all of such allotments were transferred to northeast Louisiana where, in 1977, approximately 18,500 acres of allotments were assigned and 51,000 acres were grown. None of the eight river parishes where rice was grown in 1956 reported rice in 1977; however, farmers in four other parishes in that general area still hold allotments totaling 855 acres, and farmers in two of these parishes grew 1,319 acres. Additional acreage was added in 1978, bringing the total to about 1,500 acres. <sup>5/</sup>

Just to the west of the river parishes are the Bayou Tesche parishes, where both sugarcane and rice are grown. Between 1976 and 1977, the acreage of rice harvested in

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<sup>4/</sup> During that period, this area was referred to as River Parishes by the Rice Millers Association in reporting acreage and production.

<sup>5/</sup> According to State Agricultural Stabilization and Conservation Service records.

these six parishes declined from 27,570 acres to 20,694 acres, indicating that farmers prefer soybeans.

No study has been made to determine the total acres of land in the river parishes that are well suited for rice production, but State cooperative extension service personnel and others indicate that as much as 140,000 to 150,000 acres is a reasonable estimate. Approximately a third of this land is in the Bayou Tesche parishes. If fully developed, 70,000 to 75,000 acres of rice could be grown annually, an increase of about 50,000 acres from 1977. However, such land is well dispersed over several parishes, making it more difficult to locate dryers as convenient to most production areas as is the case in southwest Louisiana. Furthermore, mills normally serving the area are located 80 to 120 miles to the west, imposing a substantial transportation cost.

Rice is definitely an alternative crop for such land, but the general attitude of farmers and lending agencies toward major capital outlays is cautious. Substantial investments for land forming, irrigation, harvesting and hauling equipment, and drying and storage facilities are required for a rice enterprise. Should the farm price for rough rice compared with the price for soybeans hold exceptionally favorable for the next 3 to 5 years, the acreage of rice in these river parishes likely would expand substantially.

### Puerto Rico

Total rice consumption in Puerto Rico was 362 million pounds (milled) in crop year 1974/75 and 480 million pounds in calendar year 1977--approximately 20 times the average per capita rate in the United States (2, 7).

Since there are no commercial plantings on the island, Puerto Rico's total requirement is obtained from the U.S. mainland at an annual cost of around \$90 million. This situation continues to exist even though a noticeable amount of interest in rice production has been shown there over the last two decades.

It is reported that 10,000 acres of upland rice was grown during World War II which gave yields of about 600 pounds per acre. The earliest attention given to rice by research technicians occurred about 1959. Dr. Thomas Theis and associates at the Federal Experiment Station, Mauguez, cooperating with personnel with the Agricultural Experiment Station, University of Puerto Rico, conducted tests under flooded conditions in the Lajas Valley (14). Several varieties then in use in the United States were seeded on two 8-acre plots. Yields of 2,500 pounds per acre were obtained, despite relatively poor land preparation, ineffective weed control, and inexperience in water management.

There was renewed interest in 1969 in research to determine whether the soils and climatic factors are well suited to rice production. At the Gurabo Substation in southwest Puerto Rico, plantings of varieties representing all grain types were made each month for several years (3, 10, 12). A study of these trials indicated that yields were not markedly or consistently affected by planting dates, that two or three crops could be grown yearly (varies with varieties), and that per-acre yields of 5 tons of rough rice could be obtained yearly.

Research on the response of rice to varying levels of fertilizer applications was conducted at the Gurabo Substation and in the Lajas Valley. The soils at Gurabo (toa soils) produced an average of 7,000 pounds of rough rice per acre, with no difference attributable to levels of nitrogen applications. In contrast, the three varieties used at Lajas responded strongly to the application of 200 pounds of nitrogen, the highest quantity tested, and to minor element application (10). Experiments also were conducted on seeding rates, irrigation frequency, and other cultural practices.

Investigations of the soils, water, and climate of the island resulted in 74,700 acres (77,000 cuerdas; 1 cuerda equals 0.97 acre) being classified as well suited to rice production (12). About 50,000 of these acres are in humid areas with sufficient water from rivers or aquifers for rice production. Much of such land was formerly planted to sugarcane. In the lower rainfall locations, fresh vegetables produced well and, with good markets, the land should be used for those higher valued crops.

All of the suitable soils with adequate water for irrigation are near the seacoast or adjacent to rivers. Of 10 locations identified as having potential land for rice production, the acreage suitable varied from 2,000 to 16,000 acres. This scattered distribution of resources imposes handicaps in terms of stimulating interest in a new enterprise, giving technical assistance to farmers, and extending credit to growers and processors. There also are added costs at the drying, milling, and distribution stages of the industry. However, the small size of the island (35 x 100 miles) and a good road system tends to minimize this problem.

The findings of these and other studies, coupled with the need to reduce annual costs for mainland-produced rice, were sufficiently encouraging to prompt the Puerto Rican Government to appropriate \$223,000 in 1974 to the Agricultural Experiment Station, University of Puerto Rico, to make plantings and determine the economic feasibility of producing rice on the island. Studies have centered on: (1) seeding, growing, and harvesting several fields of 40 to 60 acres on which cost data were carefully compiled and summarized, (2) constructing sufficient drying and storage facilities to condition and store the dry, rough rice produced, (3) setting up a small mill for processing, and (4) testing consumer acceptance of the rice produced (12).

These studies have been completed and several steps taken toward implementation. Plans have been developed (including required capacities and locations) to construct the drying, storing, milling, and packaging facilities needed to process, transport, and market the production from approximately 8,000 acres of rice to be grown in the first years of the program. Other plans are to lease suitable rice land to farmers, to provide them with loans for production costs, to provide technical assistance for growing rice, and to support prices to growers at \$9 per cwt.

The 1977 Puerto Rican Legislature approved the transfer of rice production land from the Land Authority to the Agricultural Development Administration. Subsequently, the Puerto Rican Department of Agriculture proposed a guaranteed price of \$9 per cwt to growers for paddy rice.

A contract for construction of a rice mill is expected to be finalized soon. A nucleus of farmers has been approved for production, which is expected to begin in 1979 with a tentative goal of 50,000 acres by 1988.

#### PRODUCTION COSTS COMPARED WITH TRADITIONAL AREAS

The Food and Agricultural Act of 1977 provides price support loans and price deficiency and disaster payments to allotment holders applicable to production from their allotted acreage. Production from excess acreage and from the total acres of non-allotment holders, in traditional or nontraditional areas, is ineligible for such benefits. Hence, regardless of location, the profitability of rice to nonallotment holders is conditioned largely by prices in the marketplace. Thus, the costs of growing rice in the study areas compared with costs in traditional areas are of interest. Since rice from southwest Louisiana would compete in the same markets with that from the river parishes and the Everglades, it is used for making this comparison (table 1). Per-acre estimated costs, delivered to local dryers, are \$264 for the

Table 1--Estimated cost of growing rice in study areas compared with cost for southwest Louisiana 1/

Item	Everglades <u>2/</u>	River parishes <u>3/</u>	Puerto Rico <u>4/</u>	Southwest Louisiana <u>5/</u>
	<u>Dollars</u>			
Production costs:				
Delivered to dryer--				
Per acre	264.00	291.00	268.00	225.00
Per cwt	5.08	6.77	5.58	5.76
Delivered to mill, per cwt <u>6/</u>	6.40	7.02	5.83	5.92
	<u>Hundredweight</u>			
Yield per acre	52	43	48	39

1/ Costs are applicable to 1978 season and include all variable and equipment ownership costs; excludes general farm overhead, land, and management charges.

2/ Costs estimated in (7) plus costs of harvesting, drying, storing, and hauling.

3/ Costs applicable to Mississippi Delta (9).

4/ Variable costs, excluding land and management charges; see table 9 (2).

5/ Source: (9).

6/ Hauling to mill estimated at \$1.32 per cwt for Everglades, 25 cents for river parishes and Puerto Rico, and 16 cents for southwest Louisiana.

Everglades and \$291 for the river parishes, compared with \$225 for southwest Louisiana. Based on yields, the cost per cwt is \$5.08, \$6.77, and \$5.76, respectively. 6/

The estimated costs for Puerto Rico are \$268 per acre delivered to dryers, which is \$4 more than the costs for the Everglades, \$43 higher than for southwest Louisiana, and \$23 lower than the costs for the river parishes. Delivered to dryer, the estimated cost per cwt is \$5.58, which is 50 cents higher than comparable costs for the Everglades, but 9 cents and \$1.19 less than for southwest Louisiana and the river parishes, respectively. In summary, the costs per cwt at the grower level for Puerto Rico and the Everglades compare favorably with similar costs in the traditional rice-growing areas. The feasibility of developing an effective rice industry in these areas depends largely on factors at the milling, packaging, and distributing stages. Gaining entry into markets is of major importance.

For the river parishes, the costs are comparable with costs in the central Mississippi Delta (Arkansas and Mississippi) where farmers increased rice plantings about 60 percent in 1978 over that of 1977. Success in this area will depend largely on obtaining good yields and being able to market at other than depressed prices.

6/ Estimated 1977 costs per cwt in other traditional areas are \$6.05 for the Grand Prairie and northeast Arkansas, \$6.73 to \$7.06 for the Coast Prairie of Texas, and \$5.88 for the Sacramento Valley, Calif.

## POSSIBLE SUPPLY INCREASES AND EFFECTS ON PRICES

The fact that three-fourths of the rice grown in the Southern States competes to a large degree in foreign markets prompts immediate industry-wide interest in the probable output of new production areas and subsequent effects on prices. Obviously, it is not possible to project precisely how rapidly the emerging rice industry will develop in any of the study areas. General economic growth and the level of rice production in other world regions will influence this, but conditions are favorable for development of viable local industries. As opposed to making a single projection of anticipated expansion of rice production in these areas, two levels are suggested: one reflecting a low-price/weak-demand situation and the second a relatively favorable-price/strong-demand situation for rice. A demand somewhere in between these situations is most likely.

The total land suitable for rice in the study areas is approximately 340,000 acres, of which about 200,000 acres could be seeded to rice each year (table 2). Two crops yielding 48 cwt per acre each annually could be grown on the 30,000 acres in Puerto Rico. On the 100,000 acres in the Everglades, one crop yielding 45 cwt and a ratoon crop yielding 16 to 18 cwt on a third or more of the acres could be harvested. For these two areas, these are conservative estimates of the upper limits of rice production. With farm-level prices at \$7 to \$7.25 per cwt and a planning horizon of 4 to 6 years, the acreage devoted to rice is estimated at 60,000 for the Everglades, 15,000 for the river parishes, and 10,000 for Puerto Rico. At these levels, total production is estimated at about 4.6 million cwt of rough rice. Should production in the traditional areas hold at about 130 million cwt, the study areas would increase total U.S. production by about 4 percent and total supplies by possibly 3 percent, depending on such things as carryover and reserves. This quantity would have only a minor effect on prices at the farm and wholesale levels.

Should prices hold reasonably favorable (\$9.50 to \$10 per cwt), the projected acreages devoted to rice are 100,000 for the Everglades, 30,000 for the river parishes, and 25,000 for Puerto Rico, with total production at 8.7 to 9 million cwt. This change of 6 to 7 percent in total U.S. supplies could lower the price of milled rice by \$1.25 to \$1.40 per cwt and of rough rice by 50 to 60 cents (4). However, other unpredictable factors, such as world production, could have even greater influence on prices for a given season.

## MARKET OUTLETS AND RESTRAINTS

The market outlets and strategies for moving rice from the study areas into conventional trade channels are not well identified and will have to be developed as supplies become available. Each area has different marketing opportunities that will require study before practical plans for development can be formulated. The nearest mills available for the river parishes are in the Crowley-Jennings area 80 to 120 miles to the west. Except for the distance involved, the marketing problems for farmers in this area will differ little from those of producers in southwest Louisiana.

The situation in the Everglades is quite different. A rice mill would have to be constructed to provide a market in the immediate area for rough rice. However, prospects for a good market locally appear favorable. Population numbers have increased dramatically, due to the winter tourist and retirement trade. Also, Cuban refugees have added a significant demand for rice. One rice miller in Arkansas advises that Florida has taken increasing quantities of that mill's rice in recent years.

Table 2--Rice production potential of the study areas 1/

Item	Unit	Everglades	River parishes	Puerto Rico	Total
Land suitable for rice	1,000 acres	<u>2/</u> 125	140	75	340
Annual rice acreage	do.	100	70	30	200
Estimated production:					
With low prices (\$7 to \$7.25 per cwt)	do.	60	15	<u>3/</u> 10	85
	1,000 cwt	3,120	555	950	4,625
With favorable prices (\$9.50 to \$10 per cwt)	1,000 acres	100	30	<u>3/</u> 25	155
	1,000 cwt	5,200	1,110	2,375	8,685

1/ Projections are based on an assumed time period of 4 to 6 years.

2/ This is suitable acreage of land in rotation with present sugarcane and winter vegetable acreage.

3/ Actual acreage devoted to rice, with two crops harvested per year.

Table 3--Milled rice distribution in Florida, selected marketing years

Marketing year	Total distributions <u>1/</u>	Per capita use		Proportion long grain
		Florida	United States	
	<u>1,000 cwt</u>	<u>Pounds</u>		<u>Percent</u>
1955/56	404.6	10.7	4.9	80.7
1956/57	384.2	9.6	4.8	82.2
1960/61	487.0	9.5	5.7	89.6
1961/62	516.3	9.6	6.1	89.2
1966/67	648.7	11.0	5.7	93.3
1969/70	680.0	10.2	6.4	93.2
1971/72	854.4	12.1	6.3	94.8
1972/73	813.5	10.9	6.4	95.9
1974/75	<u>2/</u> 646.8	10.0	5.8	89.6

1/ Includes distribution by millers, repackagers, and Government agencies.

2/ For the 1974/75 season, 56.4 percent of total distributions came from Texas and 42 percent from Arkansas and Mississippi.

Rice consumption in Florida of 10 to 11 pounds per capita is exceeded only by Louisiana and South Carolina, and compares with 6 to 6.5 pounds per capita for the United States (table 3). From the early fifties to marketing year 1972/73, total consumption increased from 400,000 to 800,000 cwt (milled basis). At a yield of 52 cwt per acre, about 25,000 acres would be required to supply the current Florida market.

Puerto Rico and the Virgin Islands, because of their association with the United States, are the first off-shore markets to receive attention. The per capita consumption in these areas is 8 to 15 times the average rate for most Southern States. At 125 to 135 pounds per capita, total consumption in Puerto Rico held near 3.6 million cwt for the 1974/75 marketing season (table 4).

The Virgin Islands import about 50,000 cwt of milled rice annually, which is 60 to 70 percent long grain. Supplies of good quality rice from Florida should compete effectively in this market.

The populations of the other islands in the Caribbean area, including Cuba, consume significant quantities of rice, and these islands all depend largely on imports. Total annual imports for the region range from 350,000 to 450,000 metric tons, of which about half is by Cuba. The United States exports rice to the Dominican Republic, Jamaica, the Bahamas, Netherlands Antilles, and Haiti (table 5). 7/

The United States is the principal rice supplier to the Dominican Republic and Haiti. Exports to the Netherlands Antilles, Jamaica, Trinidad, and the eastern Caribbean islands depend largely on whether Guyana and Surinam have exportable supplies. The Dominican Republic's import requirements are reduced when weather is favorable and rice production is high. Jamaica, Trinidad, and Haiti have renewed efforts to attain self-sufficiency in rice production; however, the outlook for that to occur is not favorable. Despite Cuba's efforts to increase domestic production, the country will continue to be the Caribbean's largest importer.

General economic conditions in the years ahead will set the tone of markets for rice in the Caribbean area where economics are characterized by high unemployment, low per capita income, declining private foreign investment, a growing dependence on imports, and a somewhat uncertain tourist trade. Rising production costs, low labor productivity, and general inflation also are troublesome problems. However, there likely will be a slow but persistent increase in total consumption of rice, with the United States serving as the major residual supplier except for Cuba unless there is a change in U.S./Cuban trade relations. Should this situation change favorably, the opportunity to expand rice markets in the Caribbean could be greatly enhanced.

In the Central and nearby South American countries, production of rice has increased 40 to 50 percent since 1970 (table 6). Approximately a third of the increase occurred in the traditional importing countries of Costa Rica, Guatemala, and Honduras where programs to gain self-sufficiency generally are applicable. In the surplus-producing countries, price support and related programs to benefit farmers also are in effect. In addition, mutual assistance agreements, particularly the Caribbean Common Market, are utilized to improve trade among neighboring countries. Unless Guyana and Surinam increase exportable surpluses, which is not likely in the short run, the demand for U.S. rice will continue at or increase above recent levels. Normalization of trade with Cuba would open a large market for rice, especially for medium and short grains.

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7/ The British Caribbean islands are participants in rice-marketing agreements which make Guyana their principal supplier as long as that country has an exportable surplus.

Table 4--U.S. exports of milled rice to selected Caribbean markets 1/

Destination	Exports	Destination	Exports
	<u>1,000 cwt</u>		<u>1,000 cwt</u>
Puerto Rico:		Haiti	847.9
From California	2,619.3	Dominican Republic	329.1
From Texas	443.3	Bahamas	117.9
From Louisiana	556.7	Jamaica	111.4
Total	3,620.3	Netherlands Antilles	104.9
		Barbados	13.4
Virgin Islands:		French West Indies	11.4
From California	13.9	Bermuda	6.4
From Texas	16.8		
Total <u>2/</u>	30.7	Total	15,422.3

1/ Data are for marketing year 1974/75 for Puerto Rico and the Virgin Islands, and 1976/77 for the others.

2/ This is the lowest reported figure of such exports to the Virgin Islands. Earlier exports were 76,900 cwt in marketing year 1969/70, 43,500 cwt in 1971/72, and 46,400 cwt in 1972/73.

Sources: Puerto Rico and Virgin Islands -- Econ. Statis. and Coop. Serv., U.S. Dept. of Agr. Others -- Bureau of the Census, as summarized in Rice Market News, vol. 58, no. 38.

Table 5--Average annual imports of milled rice by Caribbean islands, 1970-75

Country	From all sources	From the United States
	<u>1,000 metric tons</u>	
Cuba	247.0	0
Jamaica	37.7	12.7
Dominican Republic	30.7	18.1
Trinidad	29.5	.9
French West Indies	11.4	2.6
Netherlands Antilles	6.5	4.9
Barbados	6.4	.5
British West Indies	5.4	--
Bahamas	4.0	5.6
Grenada	1.2	--
Haiti	1.1	3.0
Antigua	1.1	--
Other	.8	1.0
Total	382.8	49.3

-- = Not available.

Sources: Food and Agri. Org., Trade Yearbook, 1975 and (13).



Table 6--Trend in rice production and trade for selected Central and South American countries which influence rice trade in the Caribbean area

Item	1970	1971	1972	1973	1974	1975	1976
Rice production:							
Import countries	87	66	102	106	125	141	147
Export countries	420	450	386	357	488	542	660
Total	507	516	488	463	613	683	807
Rice imports:							
Import countries	17	30	8	12	2	16	0
Export countries	0	0	6	0	0	11	0
Total	17	30	14	12	2	27	0
Rice exports:							
Import countries	1	0	4	0	12	10	0
Export countries	158	113	95	95	166	160	188
Total	159	113	99	95	178	170	188

1/ Import countries include Costa Rica, Guatemala, and Honduras; export countries include El Salvador, Guyana, Nicaragua, Surinam, and Venezuela.

Source: (12).

Approximately 75 percent of Puerto Rico's rice purchases are of the short-grain type produced in California. Shipping vessels especially built to carry brown rice in bulk are used exclusively to serve the Puerto Rican market. Equipment for completing the milling process and packaging is available locally. In retail trade, the rice brands are well accepted and any locally grown rice would have to compete for the consumer's food dollar on a free choice basis. Hence, to gain a significant share of the market, well-planned marketing and promotional strategies would be necessary.

## NEAR-TERM PROSPECTS FOR EXPANDED PRODUCTION

This section discusses the general interest in getting a viable rice production program going, the factors which likely will either facilitate or deter implementation of successful production and marketing programs, and specific factors that are particularly applicable to each of the study areas.

## Everglades

General conditions in the Florida Everglades appear to be particularly favorable to the development of a rice production program. The subsidence problem with organic soils is one of concern to the general public, to agencies concerned with conservation, and to landowners. If the problem is not remedied, such land would be shifted to much less profitable uses (idle, or possibly pasture). The corporate ownership of land would facilitate financing a new enterprise. Assuming favorable yields, an effective production program could be set in motion within a few years. Water for

irrigation is abundant, and the need for such things as land forming and levee construction is minimal. Production costs, including drying, storing, and delivering to mills, should average from 50 cents to \$1.25 per cwt less than comparable costs in the traditional southern areas (table 7). The markets for rice in Florida and adjoining States are comparatively strong. At least one organization has contracts with established trade in the Florida and Southeast markets and is investigating the cost of constructing a mill to serve the area. In addition, rice from the Everglades should compete effectively in markets in the Caribbean.

For these reasons, prospects for a marked expansion of rice production in the Everglades are regarded as favorable. Within 6 years, annual plantings of 50,000 to 75,000 acres are possible. General market conditions, including prices, hold the key as to the rate at which the industry will develop.

### River Parishes

Although sugarcane plantings in southern Louisiana are expected to continue their decline, rice acreages are not expected to increase in direct proportion to the decline. Crops such as soybeans, corn, and possibly grain sorghum provide alternative uses of the land. Compared to rice, the transition to these crops can be made with less additional capital for such items as new equipment, land forming, and storage facilities (table 8). However, the per-acre returns from rice would be higher than for the listed alternatives, particularly if prices hold at \$8.75 to \$9 per cwt.

Some farmers in the area have grown rice and may have irrigation facilities available. For the flatter, well-suited soils, the cost of drilling wells and fitting land for rice compares favorably with that in traditional areas. Using rice in the crop rotation is beneficial to other crops through the elimination of nonaquatic weeds and the beneficial effects on yields (especially soybeans). In the near term, the acreage of rice is expected to increase and could reach 15,000 to 18,000 acres within 3 to 5 years. Mills in the Crowley-Jennings area would serve these parishes and market the rice through established channels.

### Puerto Rico

The conditions for developing a rice producing, processing, and marketing program in Puerto Rico are considerably different from those in the other study areas. There are three problems of major concern: (1) the widely scattered and relatively small acreages of land with suitable soils and surface slopes for rice production, (2) the fact that among the native population, experience with growing, harvesting, drying, milling, and marketing rice is little more than zero, and (3) to gain acceptance in domestic markets, the local industry must compete with an established supplier who regards Puerto Rico as a major market.

These problems are not insurmountable, but each will require much planning and effort on the part of agencies responsible for all phases of a development program. Well-planned educational programs and supervision of field practices would be required at the farm level to ensure that farmers benefit from advanced technology. Optimum efficiency would be required at the drying, milling, and marketing stages. Beyond providing a major share of the capital that would be required, the role of government agencies is of major importance. A great deal of trial and error would likely be experienced in the process of implementation.

The estimated cost of growing rice in Puerto Rico is \$5.64 per cwt (table 9), which compares favorably with costs in other areas. This, coupled with a Commonwealth support price of \$9 per cwt, provides farmers a margin to cover overhead and other

Table 7--Estimated costs for producing rice in the Florida Everglades, 1978

Item	Unit	Cost per unit	Units per acre	Cost per acre
		<u>Dollars</u>	<u>Number</u>	<u>Dollars</u>
Variable costs:				
Preharvest--				
Seed	Cwt	26.00	1.20	31.20
Fertilizer	Tons	6.50	.30	1.79
Propanil	Pounds	2.43	3.00	7.31
Benlate	do.	7.50	2.00	15.00
Dibon	Gallons	29.00	.25	7.25
Custom air herbicide	Acres	1.50	4.00	6.00
Survey levees	do.	2.50	1.00	2.50
Tractor and equipment	do.	27.24	1.00	27.24
Irrigation	do.	16.65	1.00	16.65
Labor	Hours	3.40	3.98	13.54
Interest on capital	Dollars	.09	138.44	6.23
Total preharvest	do.	--	--	134.71
Harvest--				
Haul to dryer	Cwt	.17	52.00	8.50
Drying	do.	.65	52.00	33.80
Combine and equipment	Acres	7.50	1.00	7.50
Destroy levees	do.	3.42	1.00	3.42
Labor	Hours	3.40	1.90	6.46
Total harvest	Dollars	--	--	59.68
Total variable	do.	--	--	194.39
Variable cost per cwt (52 cwt yield)	do.	--	--	3.74
Fixed costs:				
Tractors, bulldozer, backhoe	do.	--	--	39.80
Combine, grain cart	do.	--	--	15.19
Pickup and field equipment	do.	--	--	14.83
Total fixed	do.	--	--	69.82
Total cost	do.	--	--	264.21
Total cost per cwt	do.	--	--	5.08

-- = Not applicable.

Source: (1).

Table 8--Estimated costs for producing rice in the Louisiana river parishes, 1978

Item	Unit	Cost per unit	Units per acre	Cost per acre
		<u>Dollars</u>	<u>Number</u>	<u>Dollars</u>
Variable costs:				
Preharvest--				
Seed (104 percent)	Cwt	19.00	1.40	26.60
Nitrogen	Pounds	.16	110.00	17.27
Phosphate	do.	.21	20.00	4.20
Potash	do.	.09	20.00	1.80
2,4,5 - T	Quarts	3.96	1.00	3.96
Propanil	Pounds	2.23	4.00	8.93
Molinate	do.	3.04	3.00	9.10
Custom air seed	Cwt	2.25	1.38	3.37
Custom air herbicide	Acres	2.50	2.00	5.00
Custom air fertilizer	Cwt	2.25	2.67	6.52
Custom air herbicide	Acres	3.50	1.00	3.50
Survey levees	do.	3.27	1.00	3.27
Tractor fuel and lube	do.	--	--	7.81
Tractor repairs	do.	--	--	5.84
Equipment fuel and lube	do.	--	--	1.48
Equipment repairs	do.	--	--	4.86
Irrigation fuel cost	do.	--	--	27.26
Irrigation lube cost	do.	--	--	3.14
Irrigation repair cost	do.	--	--	3.25
Machinery labor	do.	3.00	4.25	12.75
Other labor	do.	3.00	2.66	7.98
Irrigation labor	do.	3.60	3.30	11.87
Interest on operating capital	Dollars	.08	66.53	5.39
Total preharvest	do.	--	--	181.90
Harvest--				
Hauling	Cwt	.20	47.69	9.54
Drying and storage	do.	.64	47.69	30.52
Loading	do.	.04	42.96	1.72
Tractor fuel and lube	Acres	--	--	2.20
Tractor repairs	do.	--	--	1.23
Equipment fuel and lube	do.	--	--	2.91
Equipment repairs	do.	--	--	6.63
Machinery labor	Hours	3.00	2.37	7.11
Interest on operating capital	Dollars	.08	1.23	.10
Total harvest	do.	--	--	61.96
Total variable	do.	--	--	243.86
Variable cost per cwt (43 cwt)	do.	--	--	5.67
Ownership costs (depreciation, taxes, interest, insurance):				
Tractors	do.	--	--	12.84
Machinery and equipment	do.	--	--	27.38
Irrigation equipment	do.	--	--	6.97
Total ownership	do.	--	--	47.19
Total cost	do.	--	--	6.77
Total cost per cwt	do.	--	--	291.05

-- = Not applicable.

Source: (9).

Table 9--Estimated costs for producing rice in Puerto Rico, two crops per year, 1977 <sup>1/</sup>

Item	Unit	Cost per unit	Quantity 2/	Cost per cuerda	Cost per acre
		Dollars	Number	Dollars	Dollars
Variable costs:					
Preharvest--					
Seed	Cwt	15.00	2.40	36.00	37.11
Fertilizer <sup>3/</sup>	do.	6.15	12.00	73.80	76.08
Urea	do.	16.00	1.60	25.60	26.39
Insecticide <sup>4/</sup>	Gallons	22.00	1.00	22.00	22.68
Herbicide <sup>5/</sup>	do.	9.75	5.00	48.75	50.26
Custom air applications:					
Seed	Cwt	2.95	2.40	7.08	7.30
Fertilizer	do.	2.40	1.60	3.84	3.96
Insecticide	Cuerda	2.25	3.00	6.75	6.96
Herbicide	do.	2.65	3.00	7.95	8.19
Tractors	do.	13.30	1.00	13.30	13.71
Machinery	do.	10.70	1.00	10.70	11.03
Irrigation machinery	do.	35.10	1.00	35.10	36.18
Labor:					
Tractor and machinery	Hours	3.10	4.80	14.87	15.33
Irrigation	do.	2.53	10.53	26.64	27.46
Interest on operating capital	Dollars	.12	123.33	14.80	15.26
Total preharvest	do.	--	--	347.17	357.64
Harvest--					
Hauling <sup>6/</sup>	Cwt	.25	111.00	27.75	28.61
Drying	do.	.60	111.00	66.60	68.66
Tractors	Cuerda	6.12	1.00	6.12	6.31
Machinery	do.	19.48	1.00	19.48	20.03
Labor	Hours	3.10	2.57	7.97	8.22
Total harvest	Dollars	--	--	127.91	131.83
Total variable	do.	--	--	475.08	489.47
Fixed costs:					
Tractors	Cuerda	22.37	1.00	22.37	23.06
Machinery and equipment	do.	38.43	1.00	38.43	39.62
Total fixed	Dollars	--	--	60.80	62.68
Total cost	do.	--	--	535.88	552.15
Total cost/cwt (2 crops, 95 cwt total yield)	do.	--	--	5.64	5.81

-- = Not applicable.

<sup>1/</sup> Assumes a yield of 95 cwt/cuerda (or 47.5 cwt/cuerda/crop) and a price of \$9/cwt, with a gross revenue of \$855/cuerda. <sup>2/</sup> Where the unit is a cuerda, the quantity is the portion of a cuerda covered with the given input(s). <sup>3/</sup> Assumes a complete 10-5-15 fertilizer. <sup>4/</sup> Includes Diazinon and Malathion. <sup>5/</sup> Includes Propanil and 2-4D. <sup>6/</sup> Based on green weight of rice.

Source: (2).

costs that is more favorable than is the case in most other areas. If market prices are expected to be generally above the support rate, then the Commonwealth policy would provide investment confidence in periods of low prices. If market prices are expected to be generally below the Commonwealth support rate, then Puerto Rico would be subsidizing inefficient production.

Assuming a farm production program is initiated early in 1979, rice plantings would reach a level of about 10,000 acres within 4 to 6 years. With two crops harvested annually, the total production would be about 950,000 cwt of rough rice, or the equivalent of 551,000 cwt milled. <sup>8/</sup> This is approximately 11.5 percent of the Commonwealth's 1977 total consumption.

Per capita and total imports of rice have increased at a pronounced rate since 1973. Per capita use was on a slightly declining trend in earlier years, however, and projections based on a longer period (1966-76) indicate that total requirements in 1985 would be little different from the 1977 level (figs. 2 and 3). Unless per capita consumption were held at or near current levels through special programs to promote a domestic industry, it appears that the total market for rice would not expand significantly in the immediate future. Thus, a modest local rice industry could be expected to reduce to a limited degree market outlets for traditional suppliers on the mainland.

Earlier production trials include representative varieties of all grain types. In the large field plantings, however, medium- and short-grain varieties have received the most attention. Since the consumer preference is for medium and short grain, these types likely would predominate in future plantings.

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<sup>8/</sup> Based on head yield of 58 percent (2).

Figure 2.

## Total Rice Imports and Projections in Puerto Rico

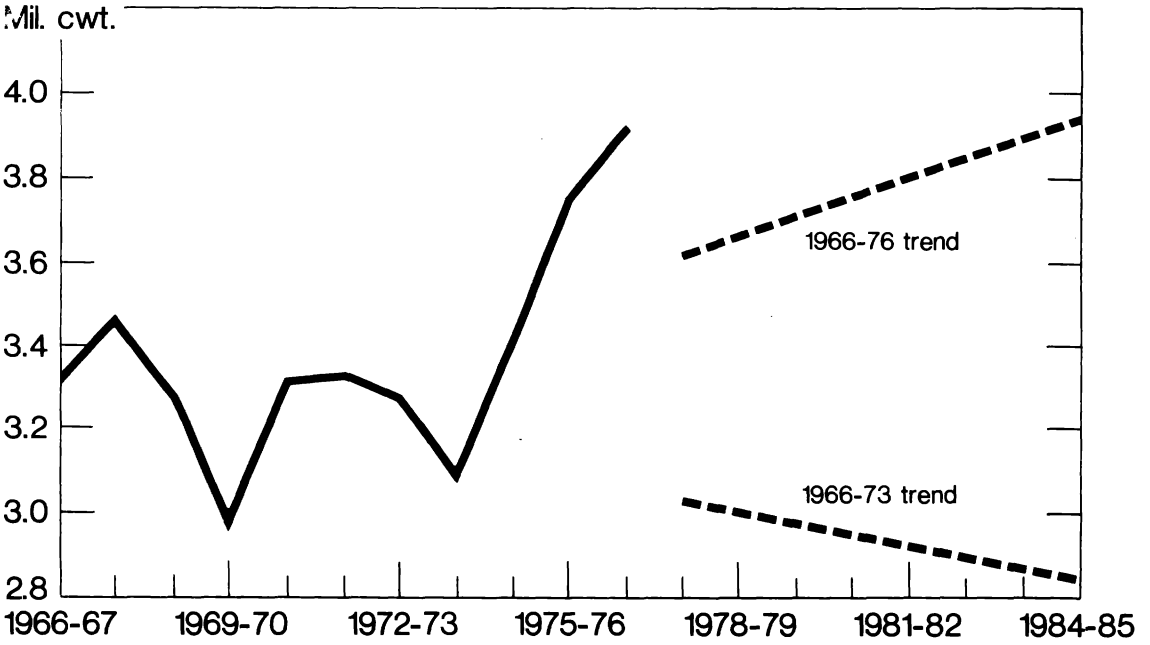
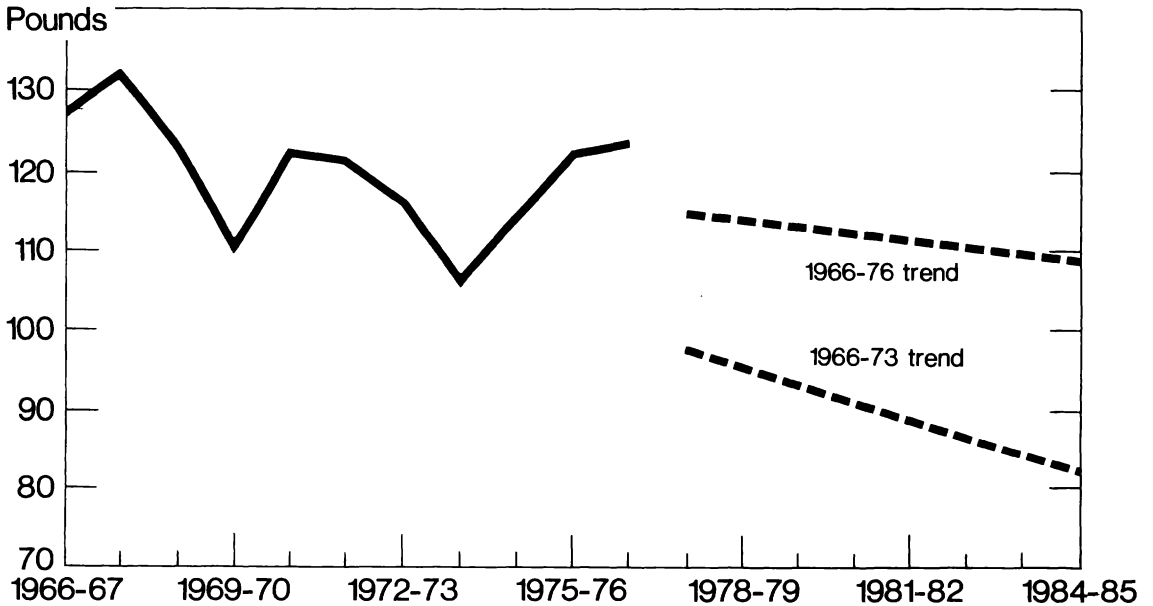


Figure 3.

## Per Capita Rice Imports and Projections in Puerto Rico



Source: (2).

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